force. A lateral force variation is estimated from lateral axle-box acceleration and track irregularity by using the frequency response method. A quasi-static lateral force is estimated from the estimation equations for Lateral-Force/Wheel-Load. We proposed a technique to presume the lateral force waveform and large lateral forces in the curve by superposing these two estimated waveforms. Finally, through the comparison with measurement results, we verified that the large lateral force could be estimated with high accuracy by the technique proposed in this paper.

TRACK FORCES AND THEIR RELATIONSHIP TO DEGRADATION OF TRACK GEOMETRY

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Keywords: Track, degradation, wheel-rail force, track geometry, track condition.

Rectification of roughness in track geometry is a major item in a track owner's maintenance budget. The quality of the alignment of track degrades with every passing train and requires constant monitoring and regular intervention. There are environmental factors contributing to this degradation, but the main cause is the combination of static and dynamic wheel/rail forces generated by passing trains. The relationship between these forces and track degradation is the focus of this paper. A study conducted by Queensland Rail and Queensland University of Technology on a heavy haul line identified how the rate of deterioration of vertical track geometry increases in proportion to the roughness of the track, as does the magnitude of vertical wheel/rail forces. An analysis of the spectrum of wheel/rail forces and track geometry wavelengths showed no force-vibrations above about 30Hz and that these low frequencies were being driven directly by long wavelengths present in the track. A direct relationship is derived between the amplitude of vibration of the forces and the rate of deterioration of the geometry of the track. The paper shows how the rate of increase in track condition indices was directly proportional to magnitude of those indices at the test site.

ANALYSIS OF CHARACTERISTICS OF POWER SPECTRAL DENSITY (PSD) OF TRACK IRREGULARITY ON THE EXISTING RAILWAY LINES

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Keywords: PSD of track irregularity, outlier, zero mean normalization, median of power spectral density, chi-square contribution.

To improve the calculation accuracy of PSD of track irregularities, an elimination method of outliers and a zero mean normalization method of track irregularities are given and used in the data preprocessing of track irregularities on the existing railway lines. The elimination method of outliers is based on the change rate of track irregularities and the method of linear interpolation, and the method of wavelet analysis is used for the zero mean normalization method of track irregularities. After the preprocessing of track irregularities, the PSD of track